

Sustainable Agricultural Intensification in the Ethiopian Highlands

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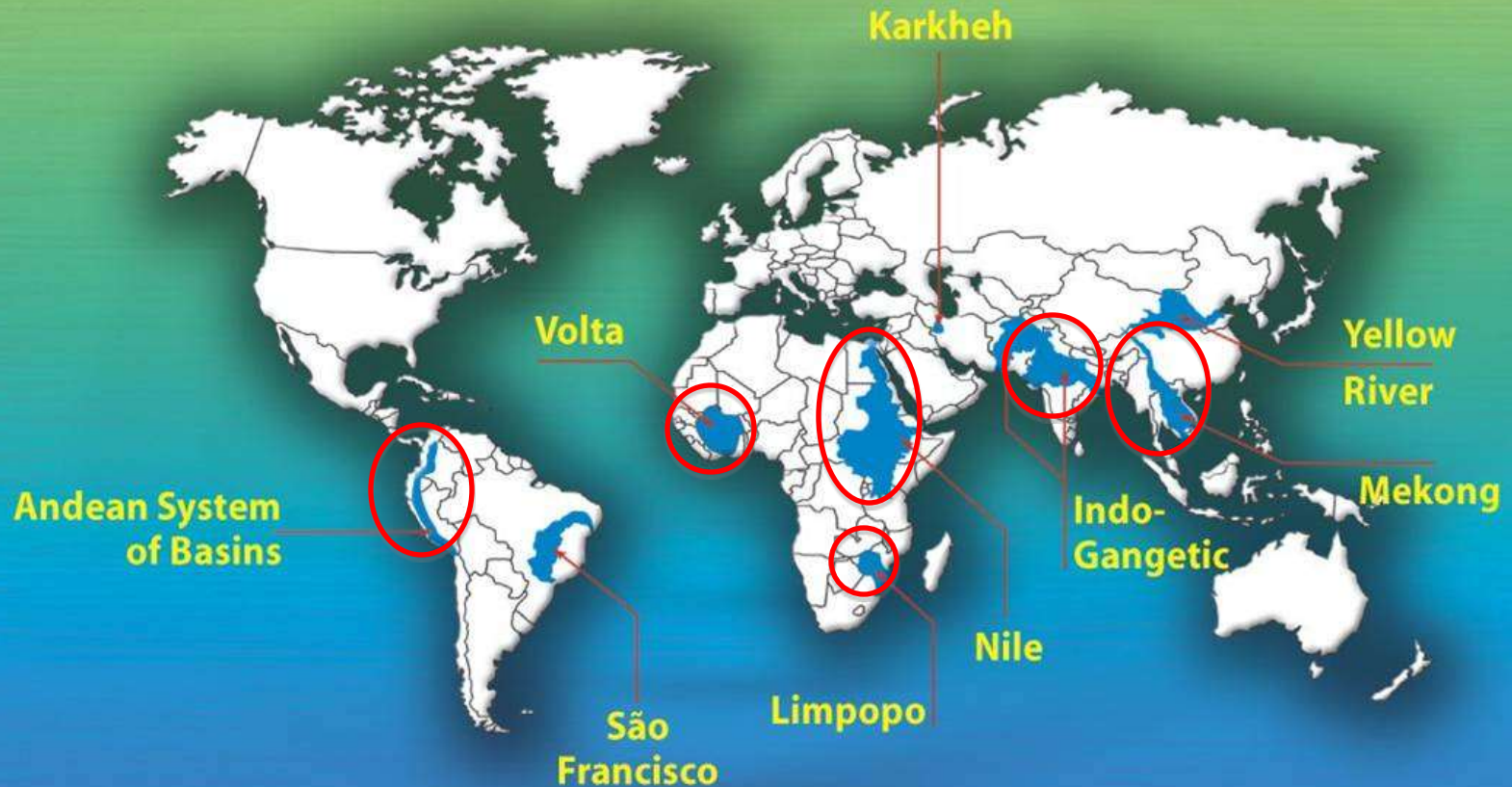


AREO

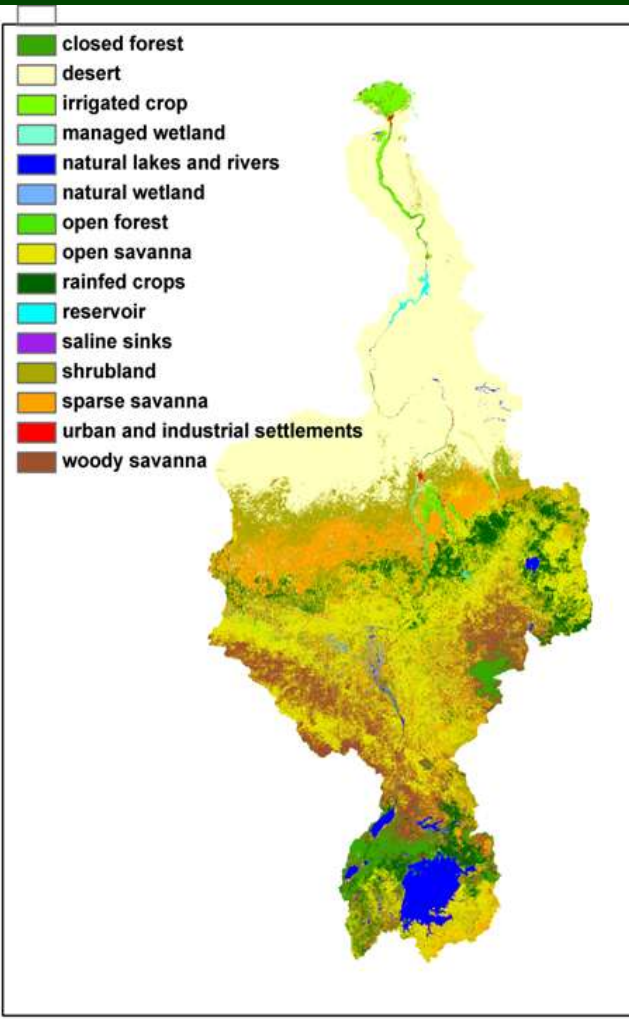


Benchmark river basins

Phase 2

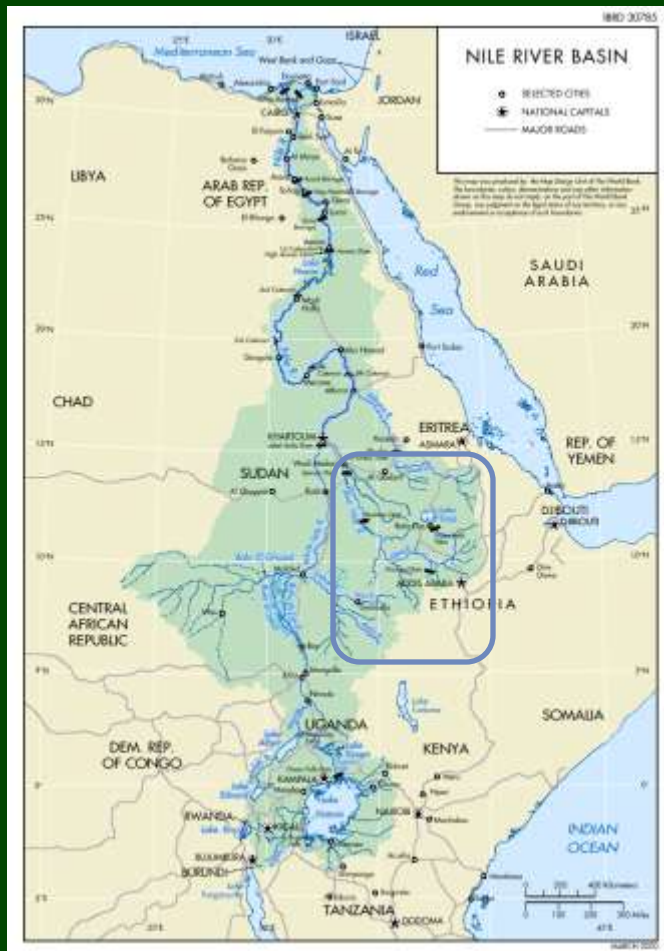


Nile Basin Development Challenge (NBDC)

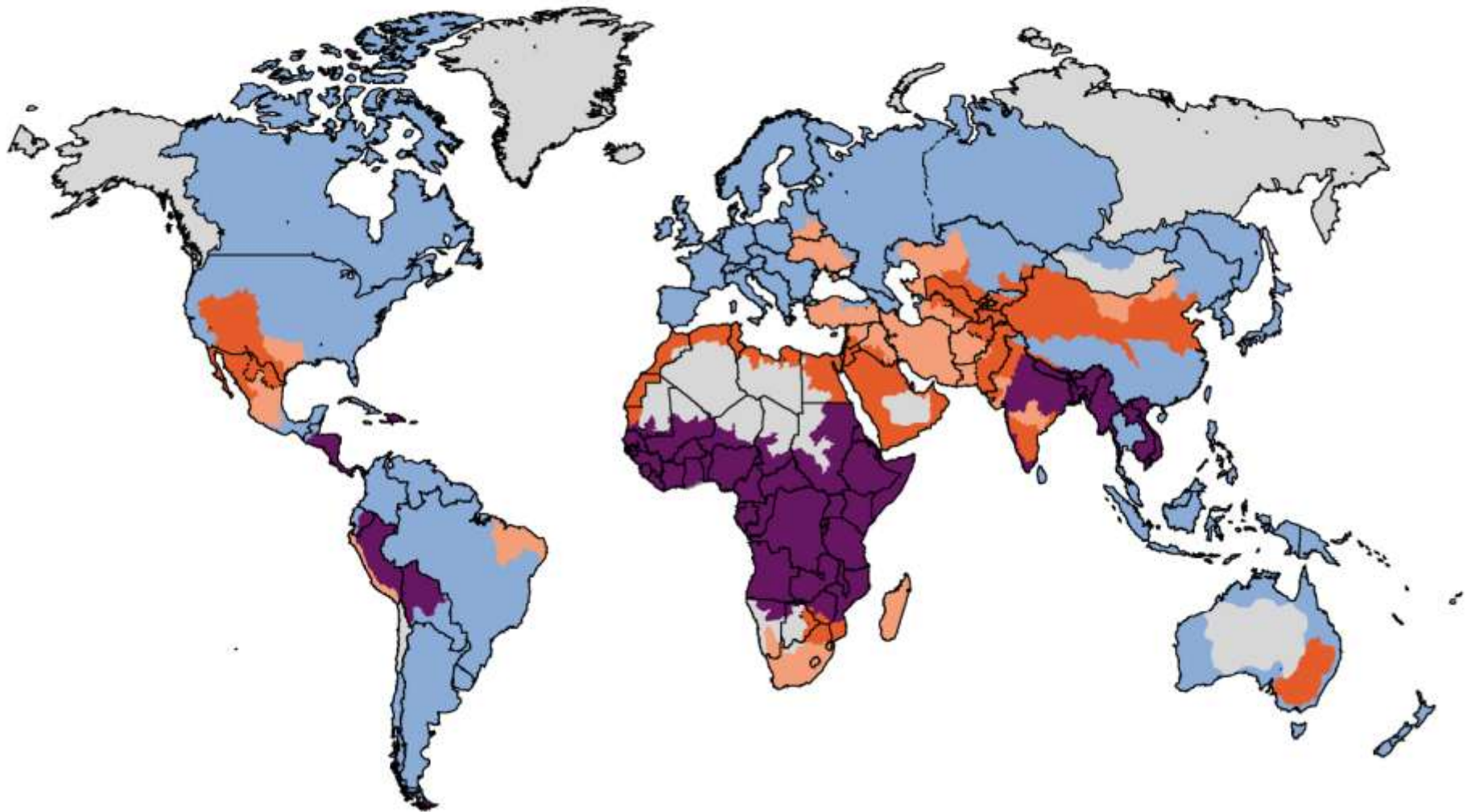
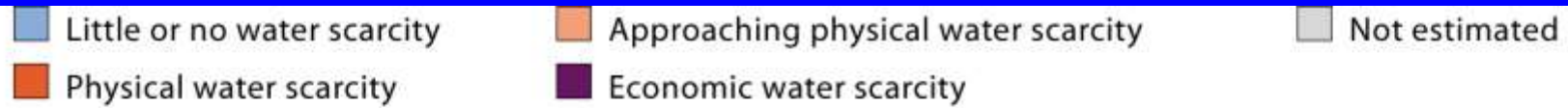


- NBD Focuses on the Ethiopian highlands and examining interrelated issues of rainwater management at Landscape and Sub-basin scales;
- Understanding causes and its consequences of low rainwater productivity;
- Innovations for improving rainwater management; addressing poverty, vulnerability and resources degradation;
 - Managing rainfall variability; increased water storage;
 - Crop and livestock water productivity;
 - Minimizing land degradation and downstream siltation of water storage infrastructure;
 - Creating capacity towards resilient communities and systems that will manage climatic and market shocks

Where are we working?



Water Scarcity Maps



1/3 of the world's population live in basins that have to deal with water scarcity

Competition for water is increasing...

- Growing concerns about climate change;



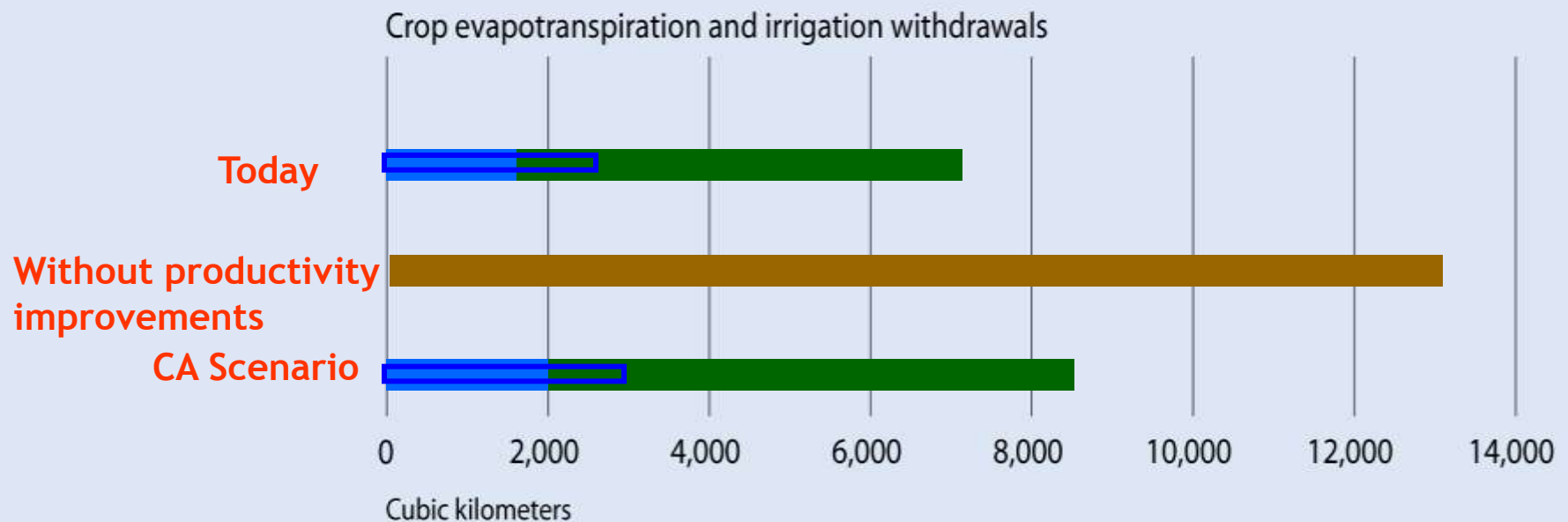
Urbanization, domestic and industrial sectors to double in the next decade;

Major trade-offs; increasing food security and safeguarding ecosystems;

- Biofuels;
- Agriculture largest water user, ca. 31% of water use; 90% livestock-related

Make Choices : Scenarios to 2050

■ Evapotranspiration by irrigation ■ Evapotranspiration by rainfall ■ Difference (pessimistic – optimistic)
■ Without productivity improvement (worst case) □ Irrigation withdrawals



Sustainable Intensification: Policies for productivity gains, upgrading rainfed, revitalized irrigation, trade

Sustainable Intensification

Long term Vs Satisfying immediate and growing needs

Driven by the need for sustaining higher productivity of land, labour and water;

1. Farm scales : increased labour or capital productivity per area unit;
2. Landscape: Improved use of resources (land, nutrients, water, labour) at landscape niches;
3. Increased use of capital (e.g. machinery, fertilizer, pesticides, irrigation)
4. Changes in land use: From subsistence to market-oriented, from extensive to intensive

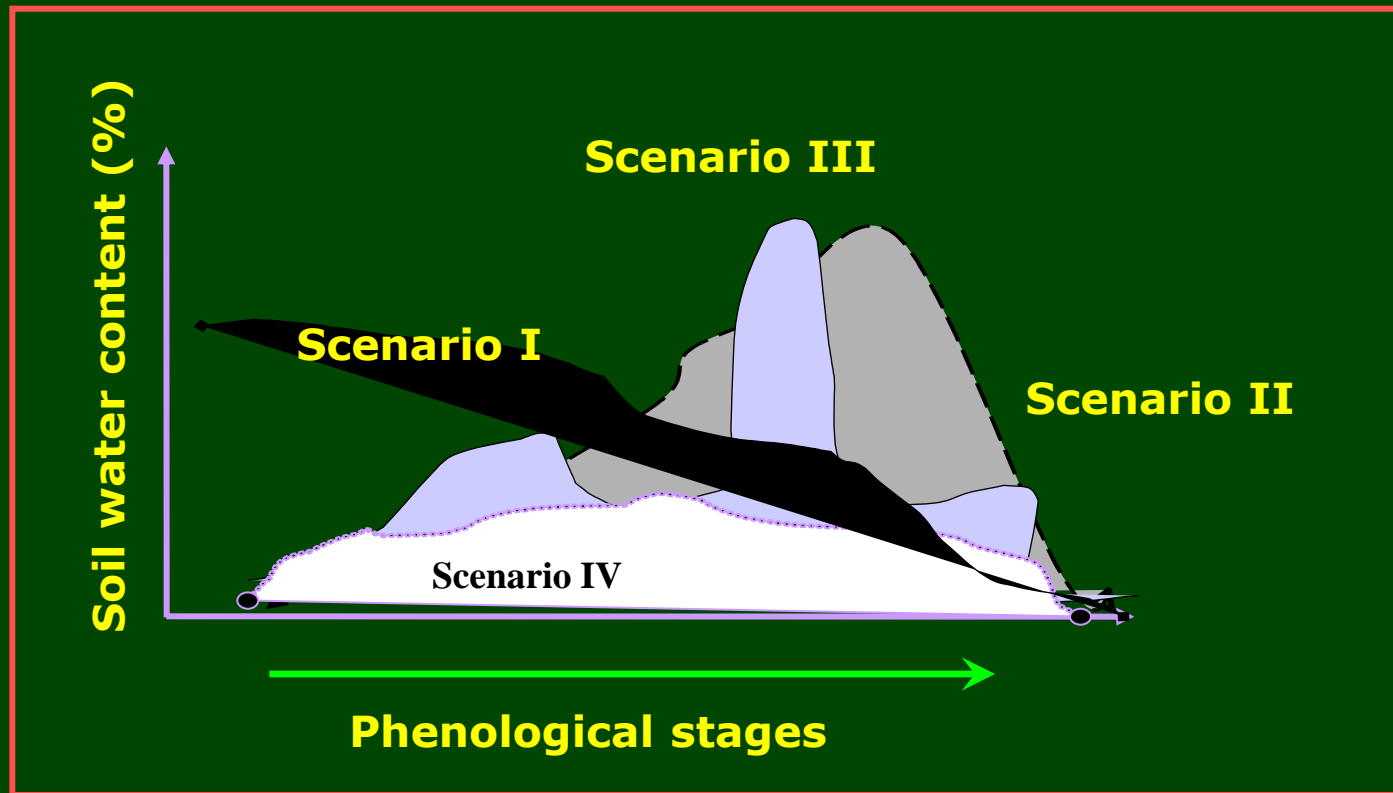
Sustainable Intensification through Addressing Resource –related Constraints



1. Understanding systems and the clients

- ✓ What are the triggers of change in enhancing productivity while promoting resilience?
- ✓ Who are the drivers and the facilitators of intensification?
- ✓ What technical, social, policy and institutional interventions are required?
- ✓ What does it cost to reverse the current scenario?

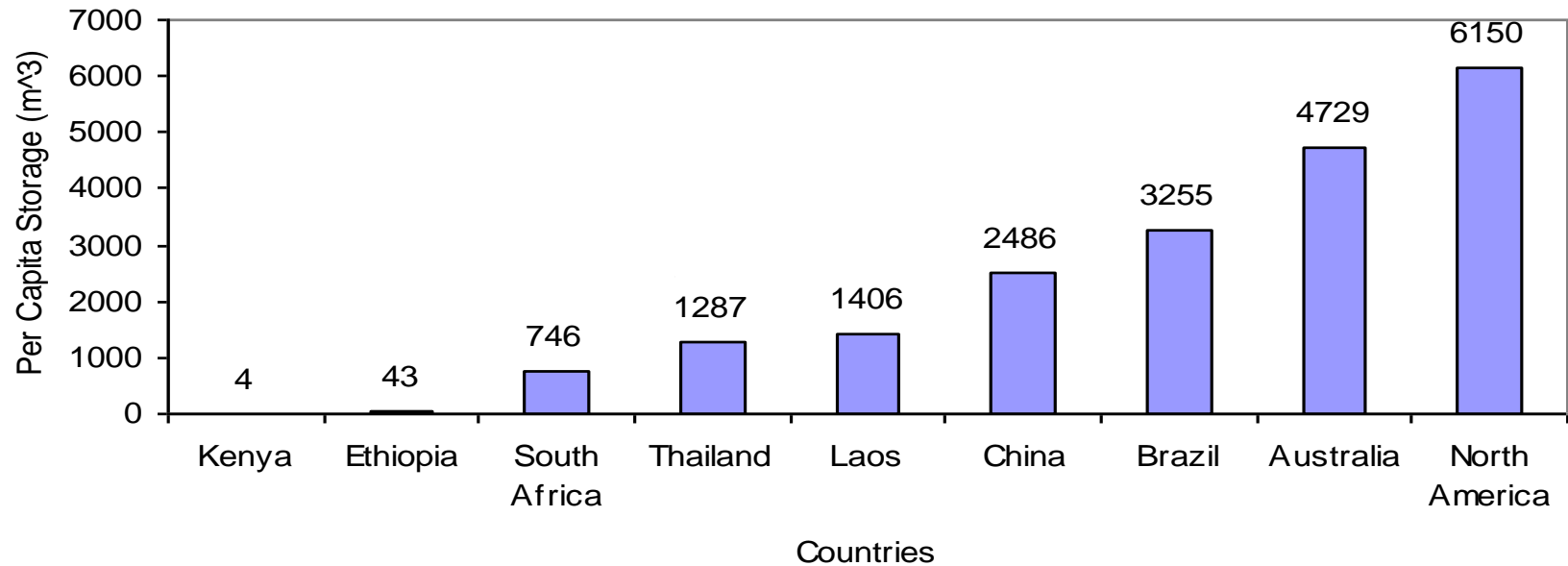
Various Drought Scenarios in SSA



Common characteristics of Ethiopian landscapes



2. Improving water storage and productivity at farms, landscape and basins



Various storage and irrigation options



Micro dam

Climate-smart Rainwater management systems (RWM)

- Integrated strategy that enables actors to systematically map, capture, store and efficiently use Green and Blue water in a landscape for productive and domestic purposes and ecosystem services.
- Decrease unproductive water losses;
- Improve the water productivity (increase returns per unit of water investment)
- Capitalizes on harvesting principles, water productivity at various scales;
- Combining water management with land and vegetation management.

Investing in Irrigation



18/06/2011

Increasing water productivity of Crop-Livestock systems

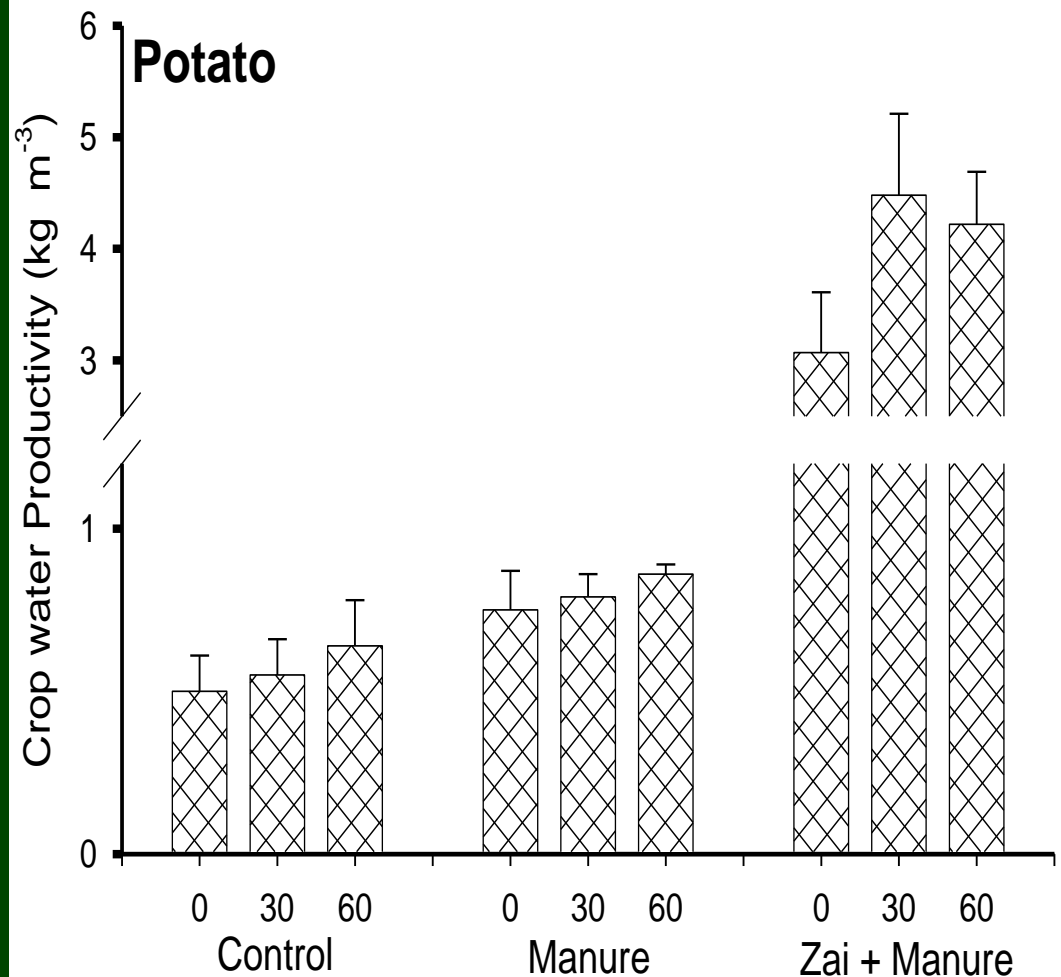
- Water productivity refers to the amount or value of product over volume or value of water depleted/diverted
- E.g. CWP refers to economic (grain, fruit, lint, fiber, feed..) yield divided by the volume of water consumed (evapo-transpiration) in the production of the total yield

➤
$$WP = \frac{\sum(\text{Net beneficial outputs})}{\sum(\text{Depleted water})}$$

- Physical or economic terms



Improving water productivity through Zai pits (Amede et al, 2011)



E.g. Watering Points for Improved Livestock Production

Energy for walking is reduced from 1956 MJ ME / TLU to 584 MJ ME / TLU per year
(Milk equivalent of 252 litre)

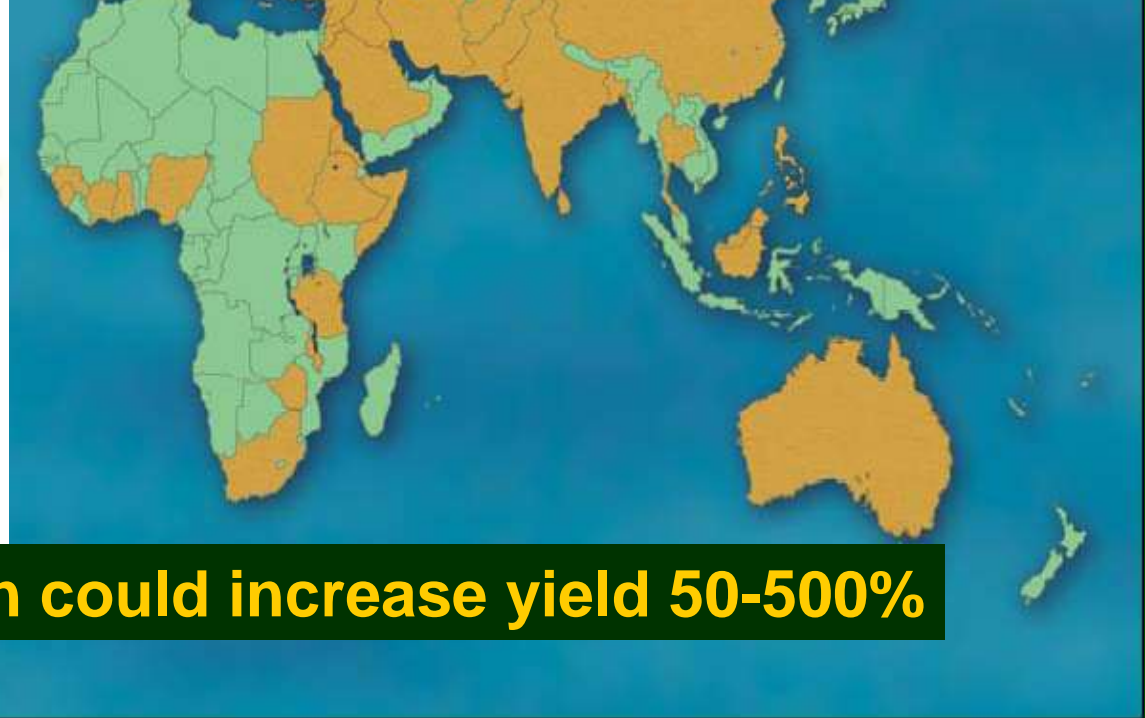
Survey: milk production increased from 343 liter to 463 liter per lactation per cow

Water: no change in water depleted for feed production

Milk water productivity per cow improves by 35% (survey)

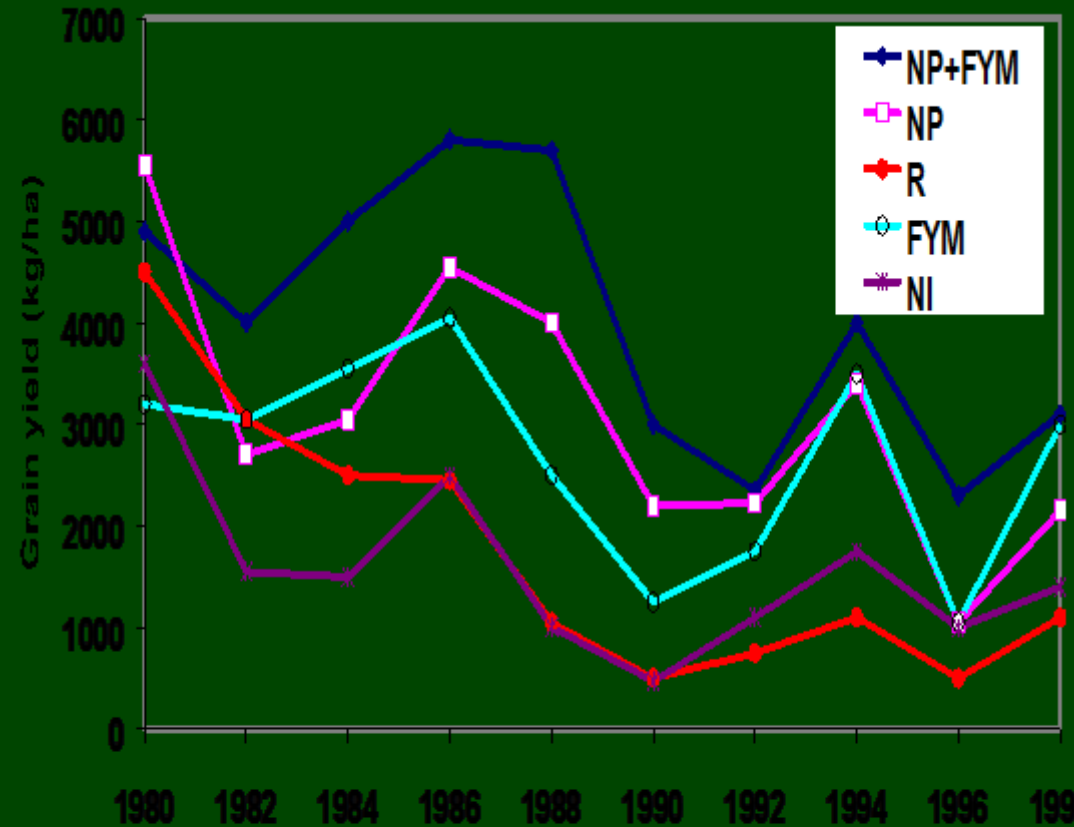
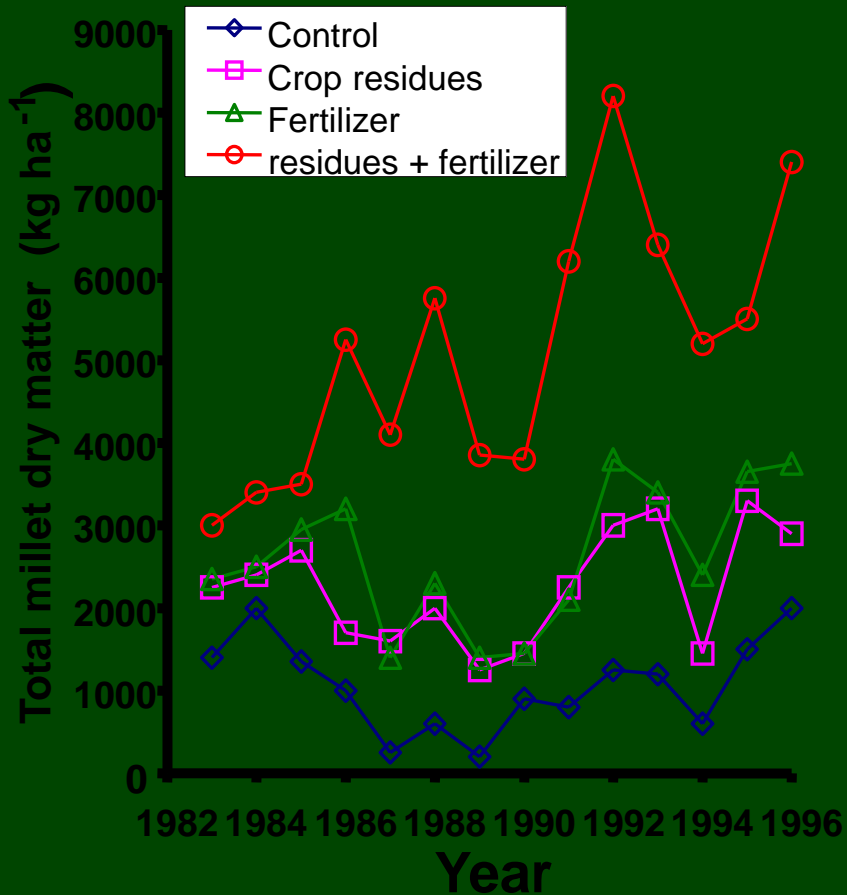


3. Intensification through improved Soil Fertility Management



Application of 5kg /ha Zn could increase yield 50-500%

Yield as affected by long term application of organic and chemical fertilizers

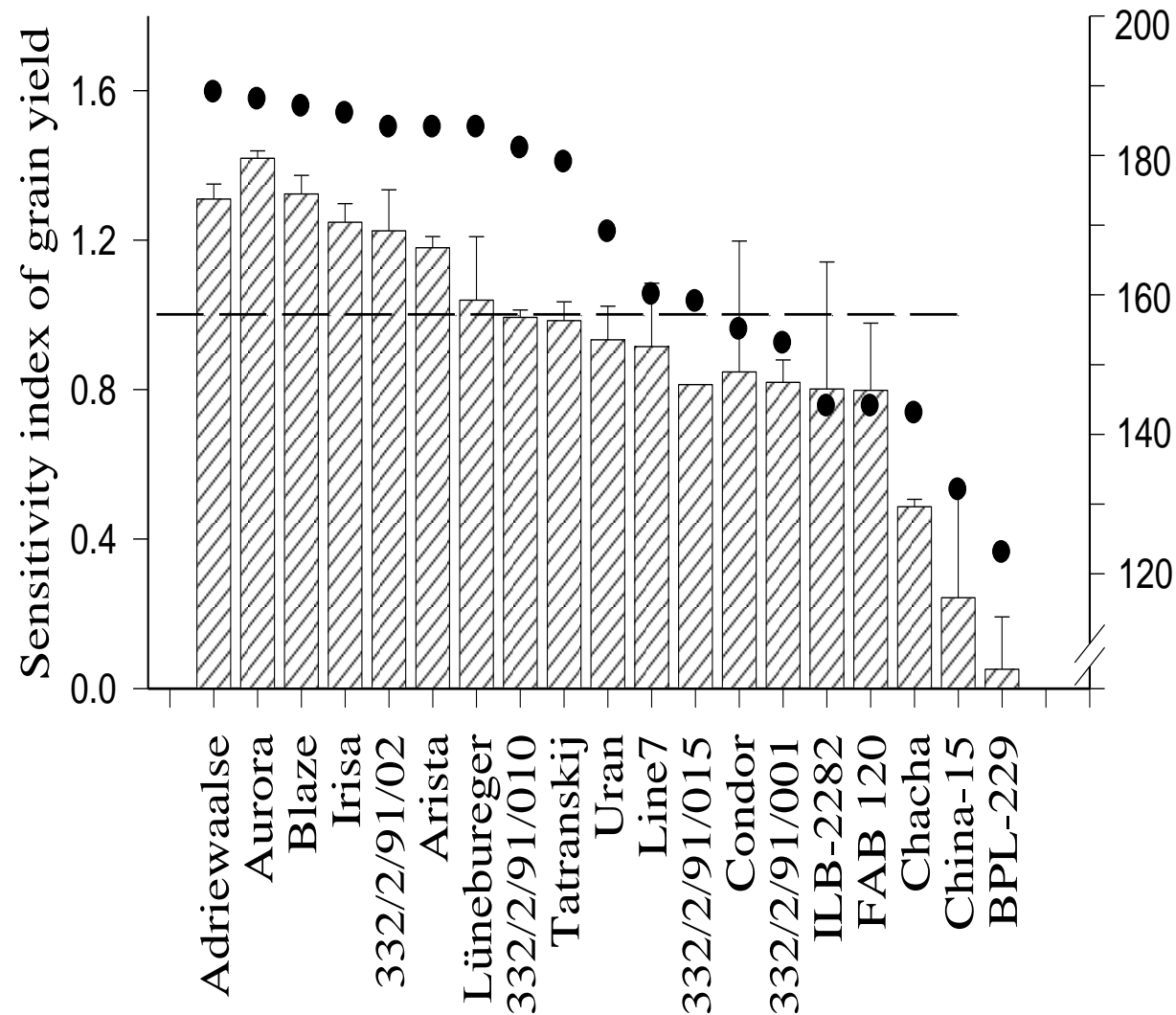


Maize yield trends for long-term trial for the period 1980 to 1998 at Kabete Nairobi, Kenya.

4. Germplasm as a key strategy



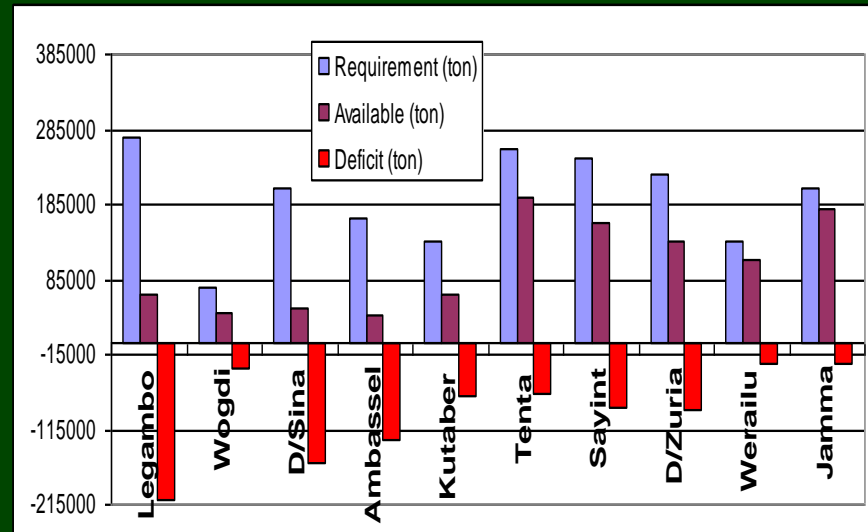
is a pot that may not
y but excellent to
genetic variability



5. Reversing Biomass Scarcity



- Livestock feed
- Cooking fuel
- Soil fertility management
- Construction and other



If we rehabilitate degraded lands and grow forages

2004



2005



May
2003



October
2005



Photo courtesy: GTZ

6. Landscape approaches for Intensification and CC adaptation



- Linking farms with landscapes
- Upstream-downstream relationships
- Niches for different options
- Resource flows
- Collective action required
- Crop-Livestock integration
- More Biomass for
Various uses

Sustainable Intensification through Addressing Systemic Constraints

7. Functional Policies in Facilitating Incentive Mechanisms

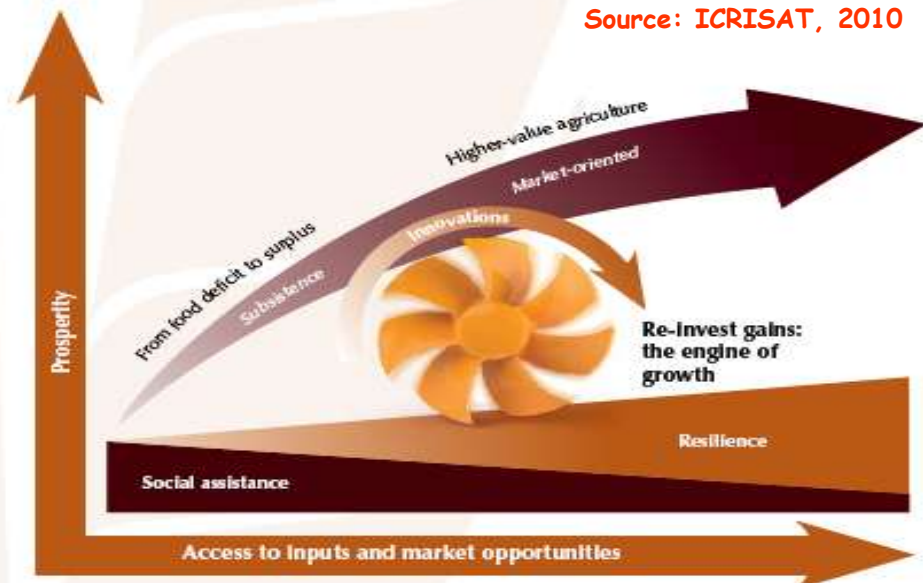
- **Market incentives** – infrastructure is rudimentary; Input-output markets malfunction; middle men, Market inconsistency
- **Policy incentives**; e.g. Tax free water pumps ; energy subsidies (e.g. Gujarat);
- **Safety-net options**: Insurance schemes; other employment options

Market incentives contributing to adoption of interventions

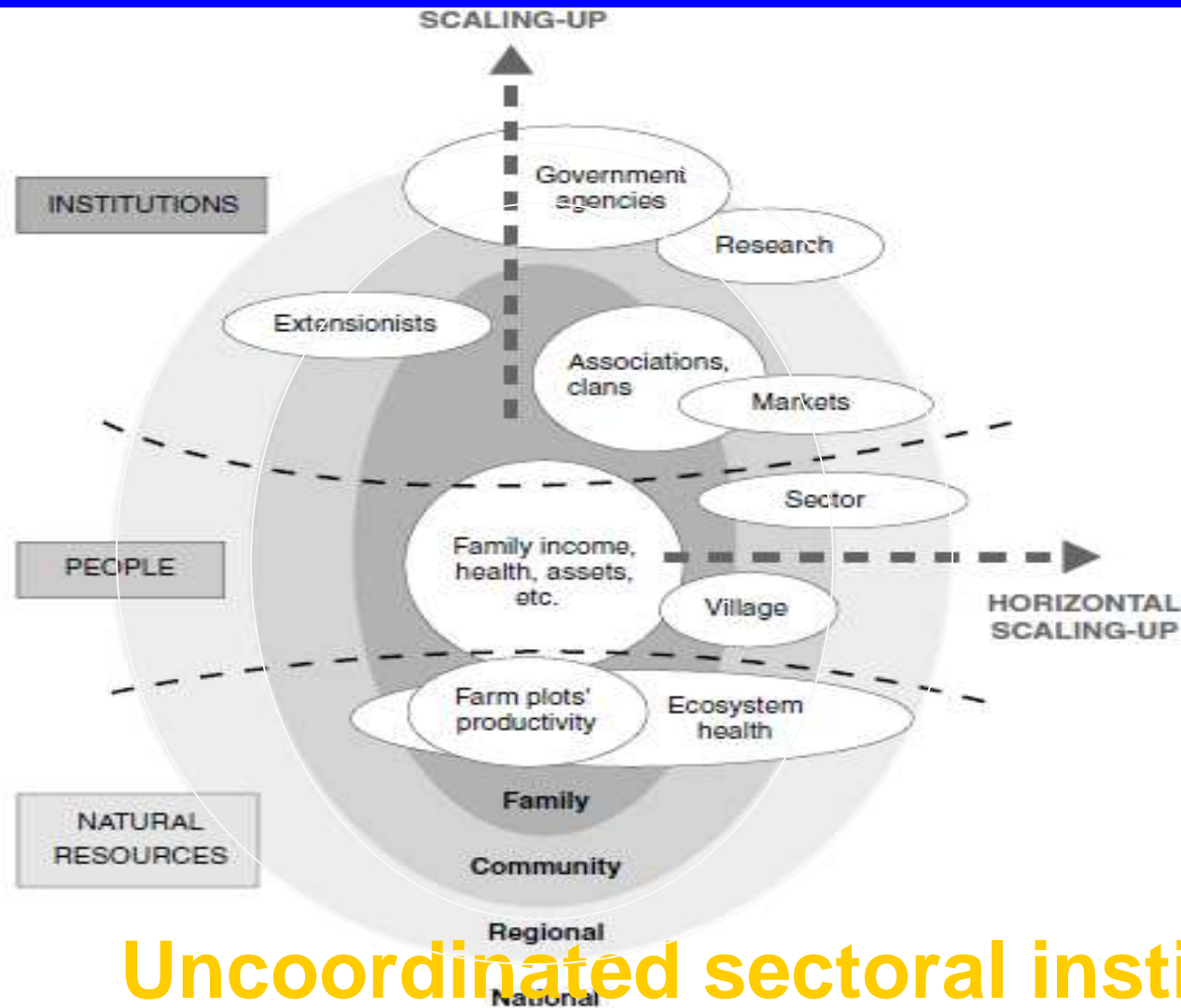


Inclusive Market-Oriented Development (IMOD)

Source: ICRISAT, 2010



8. Enhancing Institutional Capacity



Uncoordinated sectoral institutions

Large circles show increasing scales and levels while
Bubbles show interventions at different scales (IIRR, 2000)

Enabling Local Institutions



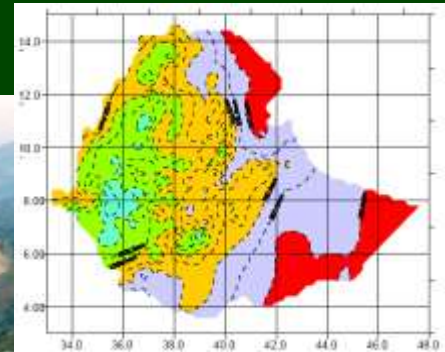
- ❖ Incentives for local communities to take charge in NRM
- ❖ Strengthening bylaws to support NRM initiatives; Negotiating improved arrangements
- ❖ Facilitate effective use of available resource & innovations;
- ❖ Increased demand / pressure;
- ❖ Enhance collective action for sustainable impact at landscape and higher levels;

8. Scaling up / Scaling out/ Scaling down

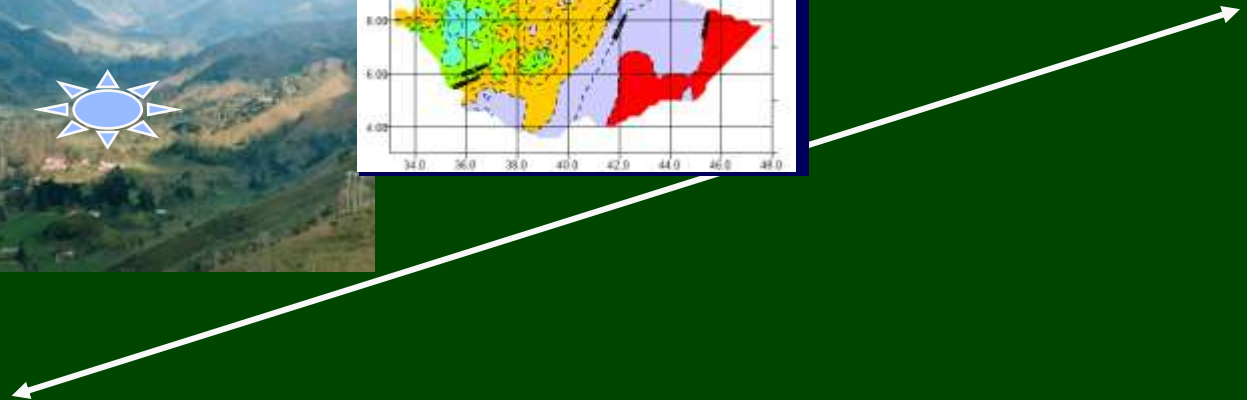
Local people
organized and using
information to manage
productive, sustainable
landscapes

Decision-makers
better informed to
help farmers
collectively
manage landscapes
and diversify/intensify
their systems

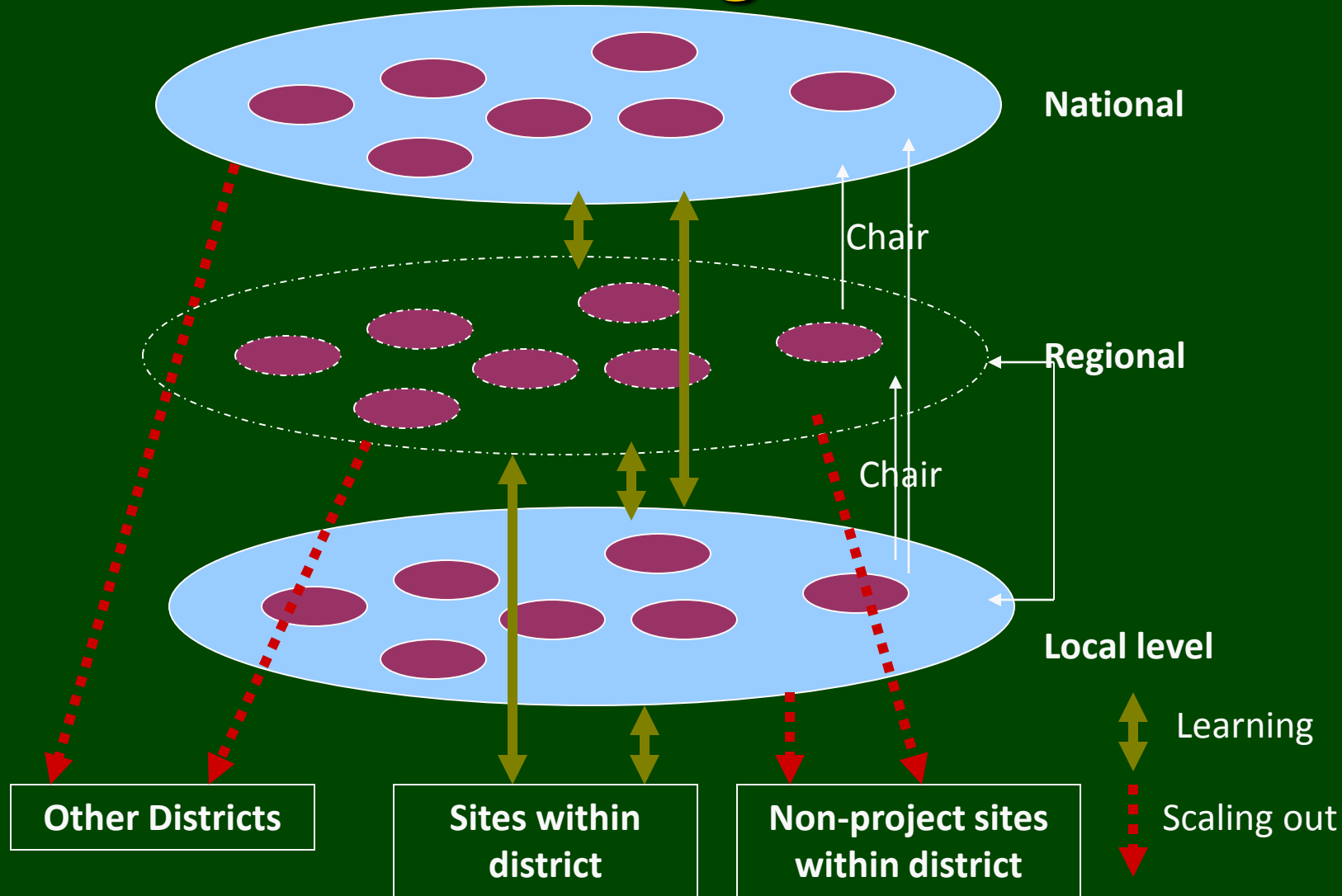
Decision-makers and
managers targeting
policy and information



More diverse
and intensive
farming systems



Creating Forums for interaction and dialogue



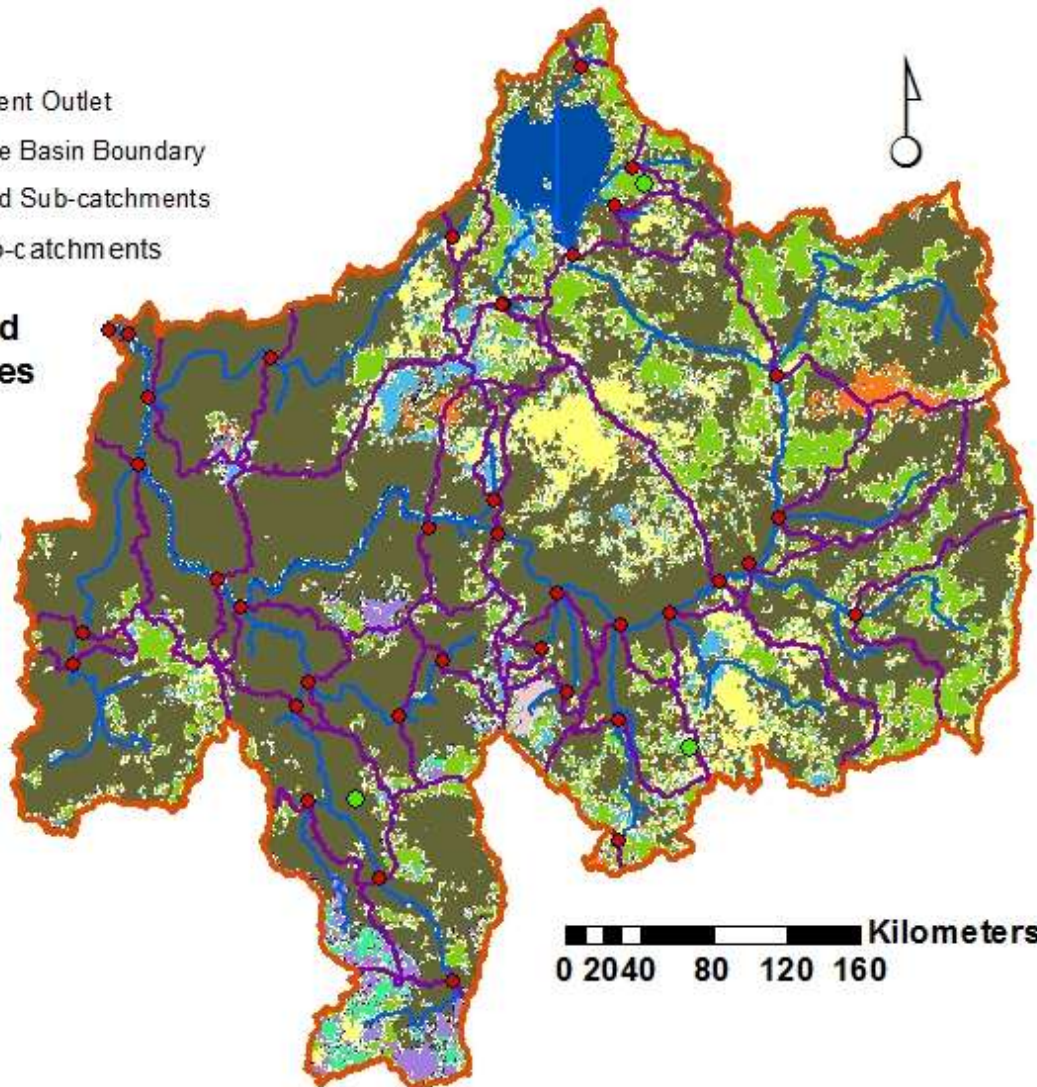
Land use -based Scaling: Hydrological Response Units delineated by geographical information system (GIS)

Legend

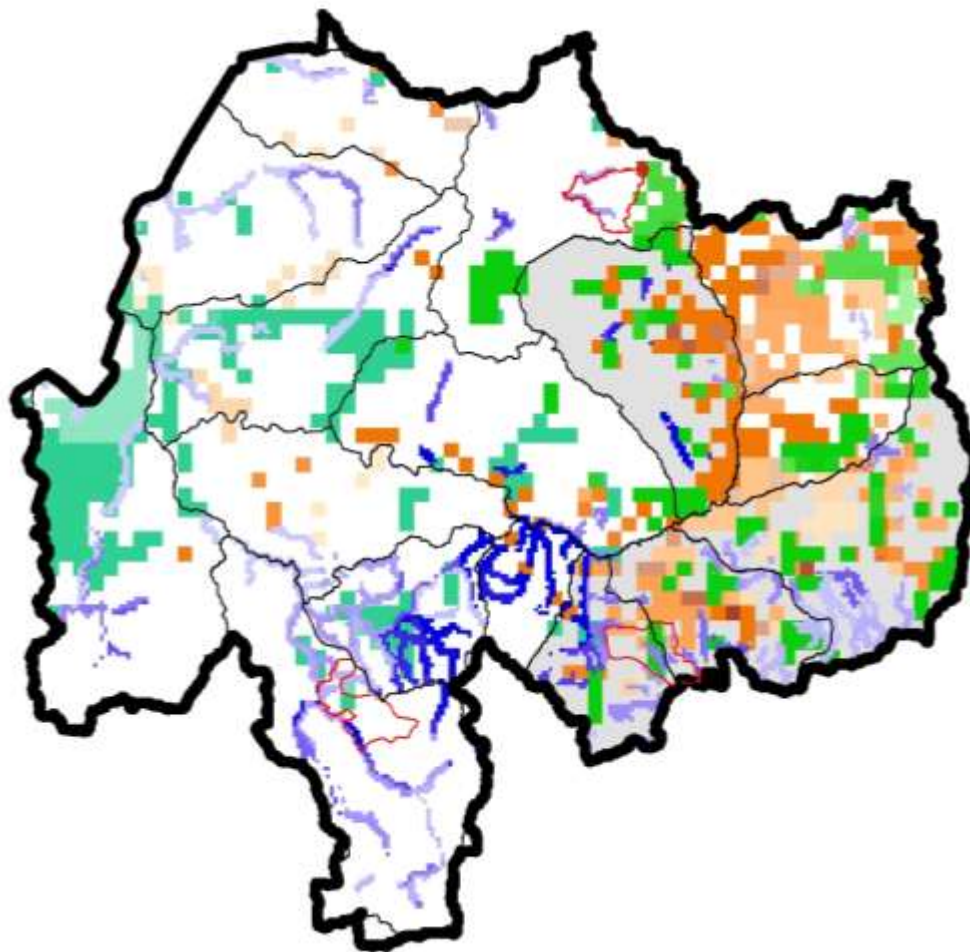
- ◆ Catchment Outlet
- Blue Nile Basin Boundary
- Modelled Sub-catchments
- N2 Sub-catchments

SWAT Land Use Classes

- URMD
- CRDY
- CRWO
- GRAS
- SHRB
- SAVA
- FODB
- FOEB
- FOMI
- WATB
- BSVG



Similarity for RMS at landscape scale



Legend

- sub-basin
- study sites

diversion

- Highly suitable
- Suitable

Apple tree

- Highly suitable
- Suitable

Mango tree

- Highly suitable
- Suitable

Bench terraces

- Highly suitable
- Suitable

Hillside terraces

- Highly suitable
- Suitable

Key messages:

- 1. Investing in water storage at landscape and higher scales (reservoirs, strategic dams, ground water etc..);**
- 2. Improving rainwater management systems, from capturing to efficient utilization and resilience;**
- 3. Availing and/or subsidizing critical inputs; fertilizers, seeds, pesticides and their efficient utilization;**
- 4. Policy geared towards creating local capacity, particularly in climate-sensitive systems
(Agriculture / wetlands / water towers/ vulnerable communities);**
- 5. Scaling strategies; niche based, participatory, wide scale**

Thank you !

